

## HIGH VOLTAGE NPN SILICON POWER TRANSISTORS

... designed for line operated audio output amplifier, and switching power supply drivers applications.

### FEATURES:

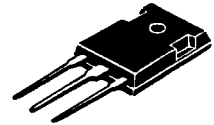
- \* Collector-Emitter Sustaining Voltage -250-400V(Min)
- \* 3 A Rated Collector Current
- \*  $f_T = 2.5\text{MHz(Min)}$  @  $I_C = 200\text{mA}$

**NPN**  
**TIP51**  
**TIP52**  
**TIP53**  
**TIP54**

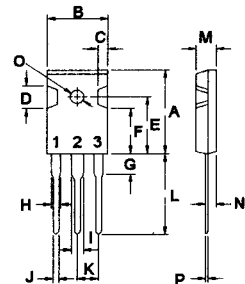
**3.0 AMPER**  
**POWER TRANSISTORS**  
**250 -400 VOLTS**  
**100 WATTS**

### MAXIMUM RATINGS

Characteristic	Symbol	TIP51	TIP52	TIP53	TIP54	Unit
Collector-Emitter Voltage	$V_{CEO}$	250	300	350	400	V
Collector-Base Voltage	$V_{CBO}$	350	400	450	500	V
Emitter-Base Voltage	$V_{EBO}$	5.0				V
Collector Current - Continuous - Peak	$I_C$	3.0 5.0				A
Base Current	$I_B$	0.6				A
Total Power Dissipation@ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	100 0.8				W W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{STG}$	-65 to +150				$^\circ\text{C}$



**TO-247(3P)**



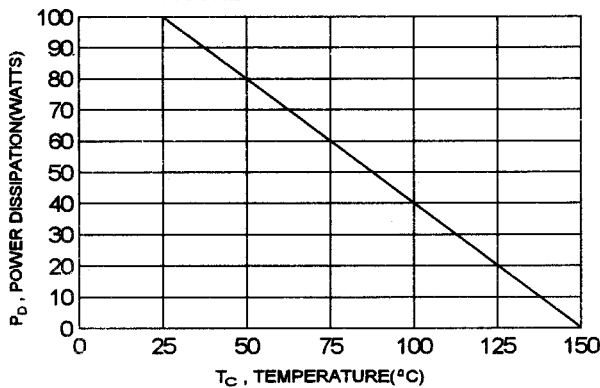
PIN 1.BASE  
2.COLLECTOR  
3.EMITTER

### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance Junction to Case	$R_{\theta jc}$	1.25	$^\circ\text{C/W}$

DIM	MILLIMETERS	
	MIN	MAX
A	20.63	22.38
B	15.38	16.20
C	1.90	2.70
D	5.10	6.10
E	14.81	15.22
F	11.72	12.84
G	4.20	4.50
H	1.82	2.46
I	2.92	3.23
J	0.89	1.53
K	5.26	5.66
L	18.50	21.50
M	4.68	5.36
N	2.40	2.80
O	3.25	3.65
P	0.55	0.70

FIGURE -1 POWER DERATING



ELECTRICAL CHARACTERISTICS (  $T_c = 25^\circ\text{C}$  unless otherwise noted )

Characteristic	Symbol	Min	Max	Unit
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## OFF CHARACTERISTICS

Collector-Emitter Sustaining Voltage(1) ( $I_C = 30\text{ mA}$ , $I_B = 0$ )	TIP51 TIP52 TIP53 TIP54	$V_{CEO(sus)}$	250 300 350 400	V
Collector Cutoff Current ( $V_{CE} = 150\text{ V}$ , $I_B = 0$ ) ( $V_{CE} = 200\text{ V}$ , $I_B = 0$ ) ( $V_{CE} = 250\text{ V}$ , $I_B = 0$ ) ( $V_{CE} = 300\text{ V}$ , $I_B = 0$ )	TIP51 TIP52 TIP53 TIP54	$I_{CEO}$		1.0 1.0 1.0 1.0 mA
Collector Cutoff Current ( $V_{CE} = 350\text{ V}$ , $V_{BE} = 0$ ) ( $V_{CE} = 400\text{ V}$ , $V_{BE} = 0$ ) ( $V_{CE} = 450\text{ V}$ , $V_{BE} = 0$ ) ( $V_{CE} = 500\text{ V}$ , $V_{BE} = 0$ )	TIP51 TIP52 TIP53 TIP54	$I_{CES}$		1.0 1.0 1.0 1.0 mA
Emitter Cutoff Current ( $V_{EB} = 5.0\text{ V}$ , $I_C = 0$ )		$I_{EBO}$		1.0 mA

## ON CHARACTERISTICS (1)

DC Current Gain ( $I_C = 0.3\text{ A}$ , $V_{CE} = 10\text{ V}$ ) ( $I_C = 3.0\text{ A}$ , $V_{CE} = 10\text{ V}$ )		$h_{FE}$	30 10	150	
Collector-Emitter Saturation Voltage ( $I_C = 3.0\text{ A}$ , $I_B = 600\text{ mA}$ )		$V_{CE(sat)}$		1.5	V
Base-Emitter On Voltage ( $I_C = 3.0\text{ A}$ , $V_{CE} = 10\text{ V}$ )		$V_{BE(on)}$		1.5	V

## DYNAMIC CHARACTERISTICS

Current Gain - Bandwidth Product (2) ( $I_C = 200\text{ mA}$ , $V_{CE} = 10\text{ V}$ , $f_{TEST} = 1.0\text{ MHz}$ )		$f_T$	2.5		MHz
Small Signal Current Gain ( $I_C = 200\text{ mA}$ , $V_{CE} = 10\text{ V}$ , $f = 1.0\text{ kHz}$ )		$h_{fe}$	30		

(1) Pulse Test: Pulse width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ (2)  $f_T = |h_{fe}| \cdot f_{TEST}$

FIG-2 DC CURRENT GAIN

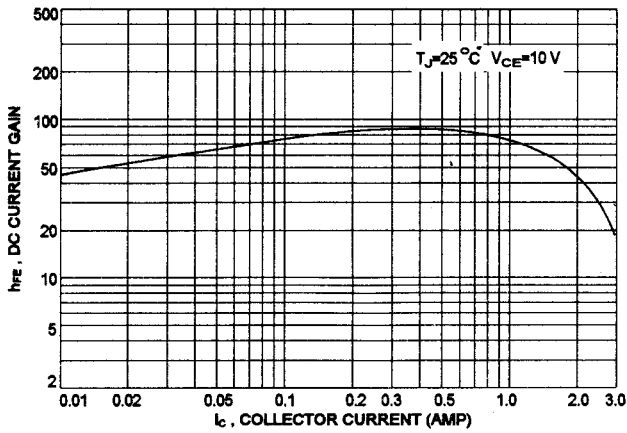


FIG-3 BASE-EMITTER VOLTAGE

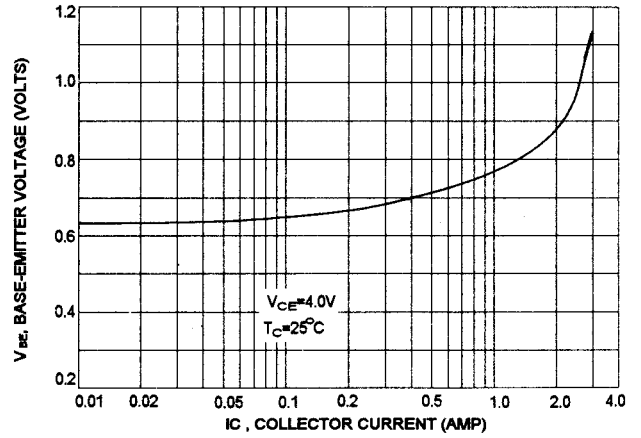


FIG-4 COLLECTOR-EMITTER SATURATION VOLTAGE

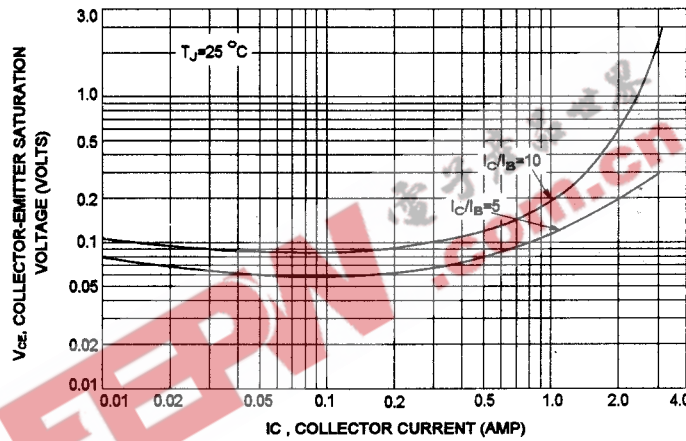
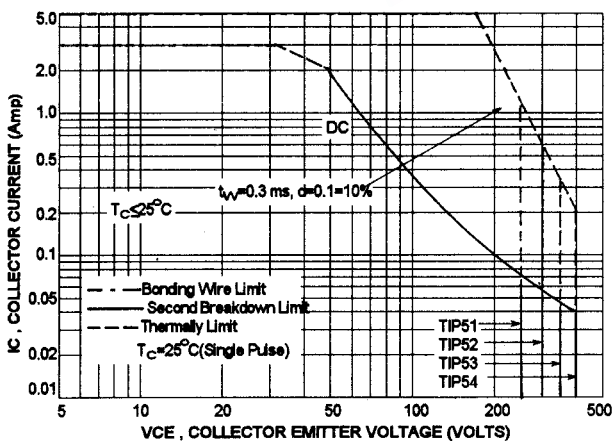


FIG-5 ACTIVE REGION SAFE OPERATING AREA



There are two limitation on the power handling ability of a transistor: average junction temperature and second breakdown safe operating area curves indicate  $I_C$ - $V_{CE}$  limits of the transistor that must be observed for reliable operation i.e., the transistor must not be subjected to greater dissipation than curves indicate.

The data of FIG-5 curve is base on  $T_{J(PK)}=150^\circ\text{C}$ ;  $T_C$  is variable depending on power level. second breakdown pulse limits are valid for duty cycles to 10% provided  $T_{J(PK)} \leq 150^\circ\text{C}$ . At high case temperatures, thermal limitation will reduce the power that can be handled to values less than the limitations imposed by second breakdown.